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THE GENERAL MEETING OF THE AMERICAN PHILOSOPHICAL SOCIETY.

A GENERAL meeting of the American Philosophical Society which undertakes to bring together the members from widely different parts of the country has now become an annual event of the week following Easter. All the general meetings which have been held so far have been highly successful and profitable and have served to arouse much interest in the history and purposes of this organization, which is the oldest scientific society on this continent. The interest in the meeting this year was in no respect inferior to that of former years, as was evidenced by the large attendance of non-resident members and by the extensive program of scientific papers.

That these meetings fill a real need in the scientific life of this country is the opinion of most of those who have attended them. This society, more than any other in this country, with the possible exception of one, stands for the solidarity of human learning. A lively appreciation of this fact is awakened by an inspection of the contents of the long series of volumes issued by the society during a period of more than one hundred and fifty years, as well as by a glance at the varied character of the papers offered at the general meeting. There are few if any organizations in this country which attempt to cover the same field. The American Association for the Advancement of Science and the National Academy of Sciences are devoted to scientific subjects in the stricter sense. The American Philosophical So-

ciety, on the other hand, is devoted not merely to the sciences, but to the humanities and literature as well. It has been objected that such an ambitious program belongs rather to the eighteenth century than to the twentieth, and certainly the numerous technical societies which have arisen in relatively recent years bear witness to the increasing tendency to specialization in all fields of learning. It does not, however, follow that the growth of these technical societies has supplanted the need of more general ones. It is of course desirable that the papers presented at the meetings of the American Philosophical Society should be of broad and general interest, and such they generally are.

These general meetings afford the opportunity of hearing and discussing recent advances in various subjects and also of meeting and becoming acquainted with eminent authorities in those fields; to many persons these have seemed to be attractions of no small order.

The meeting of the society was held this year on April 7, 8 and 9, in the historic home of the society on Independence Square, Philadelphia, where regular meetings have been held for about one hundred and twenty years. The meeting was called to order on Thursday morning with a brief address of welcome by the president, Professor Edgar F. Smith, after which the following papers were presented in the order named:

The Rôle of Carbon: Professor Albert B. Prescott, Ann Arbor, Mich.

The central position of the element carbon among the others as shown in the periodic system, together with its innate character, preeminent rather than exceptional in comparison, together give its capacity for combination. Through studies of carbon compounds chemistry at large has been enriched by facts of molecular constitution, correlated with all physical constants. When the nature of the living proteids shall become known molecular constitution will be included in that knowledge, and the atom of carbon or its theoretical equivalent will have its part in the discoveries then made.

Dimethyl Racemic Acid, its Synthesis and Derivatives: Professor H. F. Keller, Philadelphia.

The subject of this paper is an experimental study of a crystallized acid which had first been obtained, in very small quantities, by Professor Fitting and the author in an investigation upon diacetyl, an important compound of carbon discovered by them. The present paper describes the synthetic preparation of the acid on a larger scale, and by an improved method, and supplies more complete data concerning its physical and chemical characters. It records the preparation of a number of new salts and many analytical results, confirming the deductions which had been drawn from scanty observations in the original research.

Sources of Error in the Determination of the Atomic Weight of Nitrogen: Theodore W. Richards, Cambridge, Mass.

On comparing Stas's and Scott's analyses of ammonic bromide, it is shown that while Stas probably failed to purify ammonia with sufficient care, Scott, although working with purer ammonia, used bromine which was less pure. Thus Stas's results would yield too high an atomic weight of nitrogen, and Scott's one too low. The study of the other available data, including the results of Ramsay and Aston and some preliminary Harvard work, seems to show that the assumption of inconstancy in the atomic weights is not demanded by the facts, and that the atomic weight of nitrogen is between 14.02 and 14.04.

The Constituents of the Venom of the Rattlesnake: Professor JOHN MARSHALL, University of Pennsylvania.

Researches on the constituents of the venom of the rattlesnake are not as numerous as those on the physiologic action of the venom and those bearing upon attempts to discover an antidote. The most comprehensive research on the constituents of the venom of this snake was made by Drs. Weir Mitchell and Reichert in 1886. Since then a better knowledge of albuminous substances has been obtained, newer classifications of these substances have been made and more accurate methods for their separation and identification have been devised.

All of the substances hitherto separated from the venom of this snake by the methods employed were toxic. The toxicity of the substances separated is believed by the author to have been due to an admixture of a toxic substance which was precipitated with the non-toxic part as an adherent material.

By the method of separation by fractional precipitation by means of ammonium sulphate the author has been able to separate the venom (using that of the *Crotalus adamanteus*) into three fractions. Of these three fractions one is toxic and two are non-toxic. The first fraction of the series of three was separated from the venom, while in one per cent. sodium chloride solution by the very slow addition of saturated ammonium sulphate solution with constant, rapid stirring by means of a mechanical stirrer until the venom solution was saturated with ammonium sulphate solution to the extent of 4.5/10. The first fraction consists of euglobulin and pseudoglobulin, is white and non-toxic. The second fraction was obtained from the filtrate from the first by saturation to 6/10 with ammonium sulphate, is yellow and is toxic. Whether it is a chemical individual or a mixture is still under investigation. The yellow coloring matter was separated and is soluble in absolute alcohol, producing a greenish fluorescent solution. It is not a lipochrome, nor bile coloring matter, nor an ordinary coloring matter. It is non-toxic.

The third fraction was obtained from the filtrate from the second fraction by saturating with crystals of ammonium sulphate. It is white, non-toxic and consists of albumin.

The author was unable to detect any albumoses or peptone in the venom.

The Atomic Weight of Tungsten: Professor EDGAR F. SMITH and Dr. F. F. EXNER, Philadelphia.

Our study, extended over a long period, has revealed:

1. That it is quite doubtful whether any chemists who in the past occupied themselves with a redetermination of the atomic weight of tungsten have worked with pure substance. Tungstic acid is prone to form 'complexes.' It was found that if the acid contain no iron, for instance, but be digested with acids, *i. e.*, hydrochloric or nitric acid, in which iron is present, the latter will enter the tungstic acid. Iron and manganese are eliminated from the acid with the greatest difficulty. In the earlier work there is no evidence of their removal; neither do we discover that vanadium and phosphorus had been considered as present, yet in purifying ammonium paratungstate by recrystallization alone it was found that the tenth recrystallization showed vanadium.

2. The slimy, greenish or bluish-white masses believed to be 'para-tung-states' because of their great insolubility are probably 'complexes.'

3. The use of pure sodium carbonate (two per cent.) to dissolve tungsten trioxide gives an excellent means of ascertain-

ing when the iron, manganese and silica are fully removed, but that its development into a method for the determination of the atomic weight of tungsten is not at all probable.

4. The plan of digesting pure ammonium paratungstate with nitric acid, then evaporating to complete dryness and gently igniting affords pure oxide.

5. That porcelain vessels are preferable to those of gold, silver or platinum for the ignition of ammonium paratungstate and tungstic acid.

6. That the oxidation of metal (method 2) leads to reliable atomic numbers when the material is pure.

7. That tungsten hexachloride can be completely transposed into pure oxide with water and a little nitric acid.

Trisulphoxyarsenic Acid: Professor LEROY W. MCCAY, Princeton.

This paper explains how magnesium salt of trisulphoxyarsenic acid is formed. This salt has the composition represented by the formula $Na_3AsOS_3 + 11H_2O$. The tertiary potassium salt is prepared in an analogous manner. Two double salts $NaSrAsOS_3 + 10H_2O$ and $KBaAsOS_3 + 7H_2O$ have also been prepared. Methods for separating trisulphoxyarsenic acid from monosulphoxyarsenic and disulphoxyarsenic acid have been worked out and the behavior of the compound toward strong mineral acids is now under investigation. This work was done conjointly with Dr. William Foster, Jr., of Princeton University.

The Expansion of Algebraic Functions at Singular Points: Professor PRESTON A. LAMBERT, Bethlehem, Pa.

In this paper the author bases the expansion in series of algebraic functions at singular points on that application of McClanim's series which, at the last general meeting of the American Philosophical Society, was developed for the determination of all the roots of a numerical equation. The method is more direct than the methods employed for this purpose by either Puiseux or Nöther.

The Continuum and the Theory of Masses: Professor I. J. SCHWATT.

The theories of continuity as given by Peano, Borel, Couturat, Poincaré and others are viewed in the light of Cantor's ideas. The classification of the different kinds of numbers and their relation to the continuum is given. The relation between the m-fold and n-fold space and the continuity of these spaces is studied.

Biblical Pessimism: Professor PAUL HAUPT, Baltimore. Read by title.

The Ripening of Thoughts in Common: Professor OTIS T. MASON, Washington, D. C.

Thoughts in common and the activities linked with them are spoken of under the heads of biology, speech, industries, fine art, social life, learning and lore and religion. Activities which are purely biological thoughts-in-common are shared with the animals. Speech is considered as the first occasion of thoughts. Industries of life give rise to much simultaneity and identity of mental operations. The esthetic faculty affords most wonderful examples of the force of emotions felt in common. The first society developed a vast number of thoughts in common that have persisted in all ages and areas. In learning and lore and in religion the same similarity of thought is pointed out.

THURSDAY, APRIL 7.

Afternoon Session—2 o'clock.

Vice-President Scott in the chair.

An Attempt to Correlate the Marine with the Fresh and Brackish Water Mesozoic Formations of the Middle West: Professor JOHN B. HATCHER, Pittsburgh, Pa.

1. Marine and fresh-water or other non-marine deposits when present even in the same region, the one superimposed upon the other, do not necessarily represent distinct time intervals. When considered as formations they may have been deposited contemporaneously and may represent approximately the same time interval.

2. The Atlantosaurus beds and Dakota sandstones are considered as the possible equivalents of the Jurassic and Lower Cretaceous.

3. The relations of the Eagle sandstones, the Judith River beds and the Laramie to the Colorado and the Montana formations are pointed out.

The Miocene Rodentia of Patagonia: Professor WILLIAM B. SCOTT, Princeton, N. J.

Recent Advances in our Knowledge of the Evolution of the Horse: Professor HENRY F. OSBORN, New York.

The special explorations and studies on the evolution of the horse in the American Museum of Natural History, under the fund donated by Mr. William C. Whitney for this purpose, have considerably extended our knowledge of the evolution of the horse in America in recent years.

The Oligocene horses have been revised and are shown to embrace a large number of types, among which are the ancestors of at least two of the distinct lines of Miocene horses. In the Miocene it is found that the genera *Merychippus, Protohippus* and *Hypohippus* described by Leidy in the middle of the last century all represent distinct lines or stages of evolution.

The museum exploring parties under Mr. J. W. Gidley secured complete skeletons of *Mesohippus bairdii* from the Upper Miocene, the new genus *Neohipparion whitneyi* and the Lower Pleistocene horse, *Equus scotti.* The existence of three and possibly four distinct but contemporaneous lines of Miocene horses has been demonstrated.

The cause of the extinction of the Pleistocene horses in America remains a mystery. No horse remains are found recorded with human remains, as is the case in South America. It is also not positively demonstrated that the modern horse, *Equus caballus,* originated in North America. This remains an open question until we know more of the geology of Asia.

The Silurian Fauna of Arkansas: Mr. GILBERT VAN INGEN. (Introduced by Professor W. B. Scott.)

The Yukaghir Language: WALDEMAR JOCHELSON, New York. (Introduced by Dr. Franz Boas.)

The morphological peculiarities of this language may be summed up in the following main propositions.

Word-formation is accomplished mainly by means of suffixes; but prefixes are also used (almost exclusively in connection with verbal forms). In this respect the language differs from those of the Ural-Altaic group, which uses suffixes only, and approaches the American languages.

The possessive suffix of nouns is but little developed (except in the third person); the language thus differing from the Ural-Altaic, as well as from the Eskimo dialects.

Sound-harmony of vowels (*a* and *o* should not occur in the same word) is little developed, and in this respect the language resembles some of the Indian dialects, but differs absolutely from the Ural-Altaic languages with their intricate system of

vowel-harmony. For instance, an important feature of the vowel-harmony of the latter group of languages consists of the adaptation of the suffix vowels to the vowel of the root, which never changes. The vowel of the first syllable thus governs all the rest of the vowels, no matter what their number may be. In the harmony of the Yukaghir language, the root-vowel frequently adapts itself to the vowel of the suffix. Besides, in the plural forms of the personal pronouns (met, mit; tet, tit; tudel, titel) an attempt may be noticed in the language to derive new forms by means of changes of vowels within the root (the method of Semitic languages) without any additions from outside, a feature of which traces may be found in two other so-called 'isolated' Siberian languages—that of the Kott and the Ostyak from Yenisei.

The difference in the conjugation of transitive and intransitive verbs which we have in the Yukaghir language is a feature common to almost all American languages. The same may be said of the capacity of bases of transitive verbs to change into intransitive by means of suffixes, and *vice versa*.

Suffixes of purely verbal forms are different from case-suffixes, and they can not be brought in connection with personal pronouns.

A necessary element of plurality is the sound *p*; while that of futurity, *t*. In the Chukchee and Eskimo languages *t* constitutes the element of plurality, and in the Koryak language it forms the element of the dual number.

Adjectives, being verbal forms, do not undergo any inflections.

There is no difference between animate and inanimate objects, as is the case in some Indian dialects.

The feature known as 'polysynthesis' in American dialects, and which consists of a combination of two or more uninflected bases into one word, in which one of the bases expresses the principal idea, and is put at the end of the word, while the other bases figure as secondary definitive ideas, is also to be met with in the Yukaghir language.

It is true that there is no actual incorporation to be found in the language; neither pronouns nor nouns, when direct or indirect objects, are incorporated in the predicate; but the nature of the syntactical construction of the Yukaghir language is akin to incorporation. The verb plays the main part in the sentence. It is always placed at the end of the sentence, being preceded, first by the subject with all its modifiers, then by the direct and indirect objects with their modifers, then by the adverbs. If the subject is not accompanied by any modifiers, and it is known from the sense of the story who the acting person is, then it is usually dropped. The subject very often does not assume the element of plurality, though there are many acting persons, as long as the sense of plurality is expressed by the verb.

The Horizontal Plane of the Skull: Dr. Franz Boas, New York.

Evening Session—8 o'clock.

At the Free Museum of Science and Art, University of Pennsylvania, President Smith in the chair.

Pompeii and Saint Pierre: an Examination of the Plinian Narration, and other Studies (with lantern slide illustrations): Professor Angelo Heilprin, Philadelphia.

A reception was given in honor of the members of the society and the ladies accompanying them, at 9 o'clock, at the Free Museum of Science and Art.

FRIDAY, APRIL 8.

Morning Session—10 o'clock.

Vice-President Barker in the chair.

The Reflex Zenith Tube: Professor CHAS. L. DOOLITTLE, Philadelphia.

More than fifty years ago an instrument known by this name was constructed from designs by Mr. J. B. Airy for use at Greenwich. The instrument consists of a telescope fixed in a vertical position. A basin of mercury below the objective at a distance equal to one half its focal length reflects the rays from a zenith star upwards, bringing them to a focus immediately in front of the objective. A micrometer thread moving in the focal plane furnishes the means of measuring the positions of stars which culminate sufficiently near the zenith to be within the field of view. The instrument was designed especially for use with γ Draconis, which culminated very near the zenith of Greenwich. The object was a more accurate determination of the constant of aberration, and incidentally the star's parallax. So far as known this is the only instrument of this description ever constructed.

In the course of the long series of latitude observations carried on at South Bethlehem, and afterwards at this place, anomalous results have appeared from time to time which seem to merit further study. The practical method for attacking the problem appears to be to carry on two series of observations simultaneously, employing two instruments of different construction. With this in view Mr. Joseph Wharton has generously provided the means for installing a reflex zenith tube of eight inches aperture at this place. Warner and Swasey have this instrument well advanced and it is hoped that it may be in practical operation at an early day.

It will be used in connection with the zenith telescope, which has been thoroughly renovated and the optical power increased so that stars as faint as the eighth magnitude may be employed. It is hoped that simultaneous observations with the two instruments may be carried on for two or three years at least.

Faint Double Stars: Mr. ERIC DOOLITTLE, Philadelphia.

The table of limiting distances given by Mr. R. T. A. Innes, within which a pair of stars is to be considered as a double star and entered into the catalogues, was examined, and the opinion was expressed that the limits of this table were too narrow. In support of this opinion it was pointed out that of the 175 Burnham stars known to be binary, 16 would have been excluded by the above criterion, and attention was called to the triple systems μ *Herculis* and *o Eridani*, which exceed the limits of the table. The 1,290 Burnham stars were examined as to proper motion, and it was shown that an average of 8 out of 51 minute stars measured in the vicinity of a bright star have an independent proper motion of their own, while an average of 27 out of 51 are carried along with the bright star; the stars examined in each case exceeded the limits of the above table. It was pointed out that many cases of proper and orbital motion might, therefore, reasonably be expected among the faint stars, and the importance was urged of securing an initial series of measures to serve as a basis for the investigation of their future motion.

New elements of μ *Herculis* were given, and the recent measures of this system and of Krueger 60 and *o Eridani* secured at the Flower Observatory were referred to.

On the Spectra and General Nature of Temporary Stars (with lantern slide illustrations): Professor WILLIAM W. CAMPBELL, Mt. Hamilton, Cal.

Our knowledge of the visual spectrum of the Orion nebula began with the invaluable pioneer observations of 1864–65 by Sir William Huggins. The first photographs

of the spectrum were obtained independently and simultaneously in March, 1882, by Sir William Huggins at Tuke Hill, London, and by Dr. Henry Draper in New York.

The Tuke Hill spectrograms of the nebula differed widely from each other, even in the most prominent features; from which the conclusion was drawn by many persons that the spectrum of the Orion nebula varies rapidly with time.

On account of the great value of accurate knowledge at this point in stellar evolution, it was desirable that the striking discrepancies shown should be explained and removed as promptly as possible. With this end in view an excellent series of spectrograms of the four Trapezium stars and four neighboring stars was secured in December, 1903, and January, 1904. These compared with spectrograms previously obtained by Campbell at the Lick Observatory, and by Keeler at Allegheny, fail to confirm the changes formerly suspected.

The discrepant Tuke Hill results for the nebula seem to be due to variations in the time of exposure, to fortuitous arrangements of the silver grains such as one must be on his guard against in under-exposed and over-developed negatives, and to the fact that the commercial plates in the eighties were considerably less sensitive than those of the last decade.

In case of the Trapezium stars, every exposure on the star is at the same time an exposure on the nebula. The particular instrumental arrangement and time of exposure may in one case emphasize the spectrum peculiar to the nebula, and in another that of the star, with the result that spectra obtained with different instruments and under different conditions will possess comparatively few points of resemblance. We can safely say that these stars are closely related to the nebula in chemical constitution and relatively closely in physical condition.

The results of this investigation were communicated to Sir William Huggins for criticism and comment. He is inclined to accept in the main the conclusions reached, with, perhaps, some reservation regarding some of the many points involved.

Systems of n Periplegmatic Orbits: Professor Edgar Odell Lovett, Princeton. (Introduced by Professor C. L. Doolittle.)

The paper on systems of periplegmatic orbits was inspired by Dr. G. W. Hill's memoir on pairs of such orbits which appeared in the current volume of the *Astronomical Journal.* The notion of a periplegmatic orbit is due to Gyldén and their theory has been elaborated in the introductory chapter of his treatise on absolute orbits. The successive sections of the present paper are occupied with triple and n-ple systems of plane periplegmatic orbits. The method of discussion employed is essentially that used by Hill and the generalizations constructed are suggested very naturally by the examples of his memoir. The concluding paragraph of the note has to do with certain pairs of entangled orbits, periplegmatic or otherwise, whose determination depends either on elliptic functions or those new uniform transcendental functions recently discovered by Painleve to which he is devoting a series of memoirs in the *Acta Mathematica.*

Palladium: Mr. Joseph Wharton, Philadelphia.

The rare metal palladium belongs to the platinum group, yet in some respects resembles silver also. It usually occurs as a companion to platinum and thus exists in many places, but in such extremely small quantity that until lately the reworking of platiniferous residues from the various mines supplied most of what appeared.

The prevailing scarcity of platinum now directs attention to palladium as a practicable substitute; for it has many of the good qualities of platinum, while its price is rather lower.

Both platinum and palladium occur in all the numerous nickel mines found among the Laurentian and Huronian rocks in the province of Ontario, Canada; the quantity of each of those metals varying from a mere trace to one or more ounces per ton, the average for each metal being about one hundredth of an ounce per ton.

Those Canadian ores carry nickel, copper, silver, gold, platinum, palladium, iridium and rhodium. The percentages of the precious metals are extremely minute and the various processes by which all these metals are recovered are naturally complicated and delicate; yet as approximately 300,000 tons of these ores are treated annually by the Orford Copper Company, which owns most of those mines, that company now produces about 3,000 ounces of palladium annually. The reports of the Canadian government upon the metallic and mineral resources of the dominion have never mentioned palladium as one of those resources.

It is not known in what condition the palladium exists in that region, but as platinum has been found there in the form of platinum arsenide, it seems probable that palladium may occur in the same condition.

Among the valuable characteristics of this metal are its hardness, ductility and malleability; it is also so non-corrodible that a polished sheet of it may long remain exposed to chlorine and hydrogen sulphide gases without tarnishing or losing its polish.

Radium from American Ores: Professor A. H. PHILLIPS, Princeton, N. J.

The mineral from which the radium was separated was carnotite, a new mineral described in July, 1899, and found as yet only in the western part of Colorado and adjacent counties of Utah. In composition it is a potassium uranyl vanadate with three molecules of water of crystallization.

In October, 1902, twenty-five pounds of this ore were obtained from Richardson, Utah. This ore contained less than ten per cent. of carnotites. Its activity as compared to uranium nitrate was .40.

This was treated with concentrated acids, as it was thought that particularly nitric acid would dissolve the radium salts.

After washing the insoluble residue the solutions were concentrated. As the ore contained very little barium, some barium chloride was added as a carrier for the radium; the sulphates were then precipitated, barium separated and obtained free from other bases by the ordinary methods.

The barium carbonate dissolved in the least possible quantity of hydrochloric acid and fractioned by crystallization three times. The final product weighed a little less than one half gram and gave an activity compared to uranyl nitrate of 1,500. The residual chlorides were recovered and weighed very near two grams, and as measured by G. B. Pegram, of Columbia, their activity compared to uranium was 365.

With these results, had a ton of ore been used, and if it were possible to concentrate the activity into one gram of barium chloride, it would give an activity of approximately 60,000.

In February, 1904, 3.5 kilos of ore were obtained from Montrose County, Colorado. This ore before treatment gave an activity of 1.71 compared to uranyl nitrate. After treatment with dilute acids the residue gave an activity of 1.40. There was recovered from these acid solutions 3.8 grams of barium carbonate with an activity of 35.8. It was expected that the activity could be concentrated, or the radium separated from the insoluble residue by boiling with so-

dium carbonate, the work on this last specimen not having been completed. If a ton had been used in the solution and the radium concentrated it would yield a gram of barium chloride of an approximate activity of 11,300. Thus showing that while the radium is dissolved to a large extent in concentrated acids from the ores, even the dilute nitric acid dissolves it in considerable quantity, and undoubtedly, in the preparation of uranium salts, this radium would be carried by the uranium, which to a certain extent would explain the varied activity of some uranium salts.

It was thought that the above results were sufficient to prove that carnotite was a carrier of radium to a considerable extent, and would prove a valuable source of radium.

At the executive session which followed the preceding program the committee appointed at the last general meeting to prepare a plan for the appropriate celebration of the two hundredth anniversary of the birth of Benjamin Franklin reported the following plan:

For the evening of the first day, a meeting of the society with a reception of delegates and representatives accredited to the society; presentation of addresses; adjournment, followed by a general reception.

For the succeeding day in the morning, commemorative addresses on Franklin, covering his services—as citizen and philanthropist; as printer and philosopher, and as statesman and diplomatist; these exercises to be followed by a banquet in the evening.

That the society ask congress to strike a medal in honor of the occasion, of which a gold impression shall be presented by the president of the United States to the French Republic, and a number of bronze impressions shall be distributed under the direction of the president of the United States and that a certain number be placed at the disposal of this society for presentation to institutions and societies of learning, including those with which Franklin was connected.

That the following guests be invited to participate in the celebration: the president of the United States; the vice-president and other high officers of state; the governors of the states of which Franklin was the colonial agent; foreign ambassadors accredited to the United States; a special representative from the republic of France; special representatives from societies and institutions with which Franklin was connected; representatives from home and foreign scientific societies and institutions of learning with which the American Philosophical Society is in correspondence.

The report of the committee was approved and the committee continued with instructions to carry out the plan as proposed, with authority to make such modifications as may seem to it desirable, to fix the time and place for the celebration and with full power to do all things necessary or desirable for the appropriate celebration of the anniversary.

At the annual election the following persons were chosen members:

Maurice Bloomfield, Ph.D., LL.D., Baltimore.

Professor of Sanskrit and comparative philology at the Johns Hopkins University; editor of the 'Kashmirian Atharra-Veda,' 3 vols., 1901; translator of the Hymns of the Atharra-Veda in Max Müller's edition of the 'Sacred Books of the East' (Vol. 42); author of numerous papers in the *Journal of the American Oriental Society*, etc.

Henry Pickering Bowditch, M.D., LL.D. (Edin.), Sc.D. (Cantab.), Jamaica Plains, Mass.

Professor of physiology in Harvard University; one of the authors of the 'American Text-Book of Physiology'; author of numerous important contributions to physiology.

Edward Potts Cheyney, Philadelphia.

Professor of history at the University of Pennsylvania; author of 'Introduction to the Industrial

and Social History of England' (1901), 'Social Changes in England in the Sixteenth Century as Reflected in Contemporary Literature' (1895), 'Short History of England' (in press), etc.

Russell H. Chittenden, Ph.D., New Haven.

Professor of physiological chemistry in Yale University; director of Sheffield Scientific School, Yale; president of American Society of Naturalists, 1893; president of American Physiological Society, 1895; author of 'Studies in Physiological Chemistry,' 4 vols., and of many papers on physiological subjects in American and foreign journals; associate editor of the *American Journal of Physiology* and of *Journal of Experimental Medicine*.

Frank Wigglesworth Clarke, S.B., Sc.D., Washington.

Chief chemist in the United States Geological Survey; formerly professor of chemistry in Cornell University and in the University of Cincinnati; author of 'Elements of Chemistry,' 'Weights, Measures and Money of all Nations'; past president of American Chemical Society, chairman of International Committee on Atomic Weights.

John Chalmers Da Costa, M.D., Philadelphia.

Professor of surgery in Jefferson Medical College; author of a text-book on 'Modern Surgery' and of many contributions to medical periodical literature.

Kuno Francke, Ph.D., Cambridge, Mass.

Professor of German literature at Harvard University; author of 'Social Forces in German Literature' and of numerous monographs; curator of the Harvard Germanic Museum.

Adolphus W. Greely, U. S. A., Washington.

Brigadier-General and chief signal officer of the United States Army; distinguished meteorologist and Arctic explorer; gold medallist of the Royal Geographical Society and of the French Geographical Society; author of 'Chronological List of Auroras,' 'Diurnal Fluctuations of Barometric Pressure,' 'Report of the Proceedings of the United States Expedition to Lady Franklin Bay, Grinnell Land,' 2 vols., 4to, 1888; 'Three Years of Arctic Service,' 'American Weather,' 'Climatology of Arid Region,' etc.

Preston Albert Lambert, Bethlehem, Pa.

Assistant professor of mathematics at Lehigh University; author of text-book on 'Analytic Geometry and Differential and Integral Calculus.'

Edgar Odell Lovett, Ph.D., LL.D., Princeton.

Professor of mathematics in Princeton University; member of the American Mathematical Society, Société Mathématique de France, London Mathematical Society, Mathematical Society of Edinburgh, Circolo Matematico di Palermo; author of numerous important papers on mathematical and astronomical subjects.

Edward Leamington Nichols, Ph.D., Ithaca.

Professor of physics at Cornell University; editor of the *Physical Review;* author of 'The Galvanometer' (1894), 'A Laboratory Manual of Physics and Applied Electricity,' 2 vols., 'The Elements of Physics,' 3 vols., and of numerous papers on experimental physics.

Hon. Theodore Roosevelt, Washington.

President of the United States.

Samuel W. Stratton, Washington.

Director of the National Bureau of Standards, late professor of physics in the University of Chicago.

Harvey W. Wiley, A.M., M.D., LL.D., Washington.

Chief of the Bureau of Chemistry, United States Department of Agriculture; author of a 'Text-Book on Agricultural Chemistry' and of numerous papers on agricultural chemistry; past president of the American Chemical Society and of the American Society of Agricultural Chemists.

Foreign residents:

Friedrich Delitzsch, Ph.D. (Leipzig), Berlin.

Professor of Assyriology in the University of Berlin; director of the Babylonian section of the Berlin museum; author of 'Assyrisches Wörterbuch,' 'Assyrische Grammatik,' 'Wo Lag das Paradies?' and numerous other works.

Sir Richard C. Jebb, LL.D., D.C.L., Cambridge.

Regius professor of Greek at Cambridge; author of numerous contributions to classical literature, including 'Sophocles, with Critical Notes, Commentary and Translation,' 2 vols., 1883–96; president of London Hellenic Society.

Ernest Rutherford, F.R.S., Montreal.

Macdonald professor of physics at McGill University; author of numerous papers on various branches of physical science and particularly on the subject of radio-activity, and on the ionization of gases by Röntgen and Becquerel rays.

Jakob Heinrich Van't Hoff, Berlin.

Professor of chemistry in the University of Berlin; author of some epoch-making discoveries in physical chemistry and of numerous contributions to chemical literature, including 'Lectures on Theoretical and Physical Chemistry,' 'Studies in Chemical Dynamics,' 'Chemistry in Space,' etc.

Wilhelm Waldeyer, Berlin.

Rector magnificus of the university and professor of anatomy at Berlin; eminent anatomist and author of numerous contributions to the literature of anatomy.

Afternoon Session—2 o'clock.

President Smith in the chair.

A System of Passenger Car Ventilation: Dr. Charles B. Dudley, Altoona, Pa.

During the last ten years there has been developed by the various experts of the Pennsylvania Railroad Company, a system of passenger car ventilation, which bids fair to prove a reasonably successful solution of this difficult problem. The system in brief consists in taking air from the outside in through hoods covered with wire gauze to exclude coarse cinders, situated at diagonally opposite corners of the car, on what is known as the lower deck, near the top of the car. Thence the air passes through a vertical down-take through the floor to a space underneath the floor, which is bounded by the outside sill, the floor, the first intermediate sill, and the false bottom. This space underneath the floor, reaches the whole length of the car. From this space the air passes up through the floor, by means of slots in the floor, into the heater boxes where the air is warmed by the radiators. From the heater boxes the air passes out through a proper tubular aperture, situated underneath each seat, into the main aisle, from which point it distributes itself throughout the car, and finally passes out of the car through ventilators situated along the center line of the upper deck, which ventilators are so arranged that when the car is in motion, or the wind blows across the top of the car, they produce a suction on the car, helping to exhaust the foul air.

The amount of air taken through the car by the system when all the ventilators are open is about 60,000 cubic feet per hour, or approximately 1,000 cubic feet of fresh air per passenger. A passenger coach embraces about 4,000 cubic feet of space, so that the air in the car is changed fifteen times an hour.

The experiments indicating the amount of air as above were made with cars in motion in a train, and with heat in the cars. The control of the system is in the ventilators in the upper deck. By closing the valves in these ventilators, it is possible to diminish the amount of air under the same conditions as above to about half or a little more. This diminution applies during extreme cold weather, or when there are only a few passengers in the car. When the car is standing still, and there is heat in the car, nearly half the amount of fresh air that is obtained under full movement still passes through the car. When the car stands still, with no heat in the car and no lamps lighted, the amount of ventilation is still more diminished. Thus far no serious difficulties have been experienced in keeping the cars warm, even in the most severe weather, with the system of heating for which the ventilating system was devised, and the results have proved so satisfactory that the system has now been applied to about 800 passenger coaches on the Pennsylvania system east of Pittsburgh and Erie, and to nearly 200 coaches on the Pennsylvania lines west of Pittsburgh; also to some few cars on other railroads. It has not yet been applied to Pullman cars.

Atmospheric Nucleation: Professor Carl Barus, Providence, R. I.

There is considerable probability that material emanations from the sun enter

our atmosphere, and is believed that not only auroras, magnetic storms and other electrical phenomena are attributable to this cause, but that ordinary meteorological conditions, like the changes of the barometer, are thus powerfully influenced. The speaker has for several years been endeavoring to obtain direct evidence of this effect and he described the methods used for counting the number of active foreign particles (ions or nuclei) in the atmosphere.

The first method is based on the observed size of those brilliant optical phenomena called coronas and sometimes seen around the moon. These coronas are artificially produced in a vessel containing a sample of the air to be examined, and the number of particles may be computed from the coronal diameter. Lantern slides are shown giving results as obtained at Brown University, in Providence.

In a second method the speaker determined the number of nuclei from photographs of the fog particles condensed on the nuclei. Lantern slides showing fog particles even less than .0003 cm. in diameter were exhibited. The photography of these small water globules, each a perfect sphere, has never before been accomplished and the difficulties encountered were fully pointed out.

On the Collecting of Meteorites: Dr. ARISTIDES BREZINA, Vienna. (Read by Dr. Amos P. Brown.)

Matter of any kind should be collected, not only systematically but also synoptically, without starting from all points of view from which the matter in question may be arranged.

The author illustrates this thesis on a synoptical collection of meteorites formed since 1896 which consists of seven groups.

I. *Betyl Coins.*—The ancients supposed the stars to be domiciles of gods; falling-stars and falling meteorites signified the descending of a god or the sending of its image to earth.

These envoys were received with divine honors, embalmed and draped and worshipped in temples built for them.

These betyls are in the main:

The omphalos of Delphi, a black stone represented on coins of Eleuthernai, Makedonia, Myrina, Nakrasa, Neapolis, Parthia (the first six Arsacides), Rome, Syria (ten Seleucid Rings from Antiochus Soter to Alexander Bala).

The black conical stone fallen at Emisa and called El Gabal, the sun. Represented on coins of Emisa and Rome.

Zeus Kataibates on coins of Kyrrhos.

The conical stone fallen at Kypros and worshipped as image of Aphrodite Paphia.

The image of Artemis Ephesia fallen at Ephesos; represented on coins of Aizanis, Ankyra, Ephesos, Eumeneia, Nakrasa, Philadelphia, Provincia Asia, Rome, Tabai and Tiberiopolis.

The stone of Astarte on coins of Sidon and Tyros.

The pyramids of Apollon on coins of Ambrakia, Apollonia, Megara and Myrina.

The stones of Zeus Dolichenos or Herakles Sandan; coins of Tarsos.

Zeus Katios, a conical stone suspended by a chain; coins of Seleukeia.

Conical or quadratic stones on coins of Mallos or Rhosos, Perga and Synnada.

The conical stone of Aphrodite Urania on coins of Makedonia (Tetradrachms of Alexander the Great) and Uranopolis.

The simulacres of Artemis Anaïtis, Artemis Leukophrys, Artemis Pergaia, Astarte, Hera, Persephone, etc.

Coins representing related celestial bodies (comets).

In all, 250 coins from 60 towns or regions representing 22 gods.

II. *Historical meteorites* which were worshipped by primitive nations or which

formed standards in the development of meteoric science; prehistoric meteorites from tumuli or mounds, the oldest meteorite of known fall (Ensisheim, 16 November, 1492). Iron fallen with the zielid shower at Mazapil, meteor dust and terrestrial dust, etc., nineteen specimens.

III. Thirteen specimens illustrating *scattering of meteorites,* among them the stones of Lerici, Italy and Pultusk, Russia, fallen simultaneously (30 January, 1868, 7 hrs.) on the flying-line of the Pultusk-shower.

IV. One hundred and twenty-five specimens illustrating *melting and fusion, scorification, faulting and separating;* different kinds of crust, whole orientated individuals, metallic and molten veins, harnesses and fissures, products of heating, alteration-zones, wallborders bent and unbent, etc.

V. Seventy-two specimens illustrating *weathering and formation of new constituents;* different processes of oxidizing, natural dividing and uncovering of more resistant minerals, changing in limonite and nickel-minerals, etc.

VI. One hundred and thirty-six specimens illustrating *constituents of meteorites,* among them phosphor, diamond, graphite, crystals of nickel iron, cohenite, schreibersite, troilite, daubréetite, chromite, olivine, anortite, kosmochlore, enstatite, chondres of various kinds, etc.

VII. The systematic collection representing 9 classes in 58 groups and 280 localities of meteorites (irons and stones).

On the Occurrence of Artifacts Beneath a Deposit of Clay: Dr. Charles Conrad Abbott, Trenton, N. J.

On the Breeding Habits of the Spade Foot Toad (Scaphiopus Solitarius): Dr. Charles Conrad Abbott, Trenton, N. J.

Doliolum and Salpa: Professor William Keith Brooks, Baltimore.

The Organization of the Germ Cells and its Bearings on Evolution: Professor Edwin Grant Conklin, Philadelphia.

Specific substances destined to give rise in the course of development to specific parts or organs are present in the unsegmented eggs of ascidians and snails and presumably also of other animals. These substances become localized at the time of the maturation and fertilization of the egg by an active flowing of the cell substances. Modifications of this localization, produced by modifications in the direction of the protoplasmic flow, do occur and lead to profound modifications of the adult (*e. g.*, dextral and sinistral forms). It only remains to extend by hypothesis similar modifications of egg localization to the eggs of different phyla in order to throw light upon one of the most difficult problems in evolution, viz., the origin of certain phyla, such as the vertebrates.

Summary of the Recent Movements to Teach Agriculture in the Schools: Professor L. H. Bailey, Ithaca, N. Y. Read by title.

The Origin and Nature of Color in Plants: Professor Henry Kraemer, Philadelphia.

Colors in plants may be considered to be due to definite constituents which either themselves are colored or produce colors when acted upon by other substances. These substances are found in all parts of the plant, and in all of the cells excepting meristematic or dividing cells. They may be divided into two well-differentiated classes, namely, (1) those which are associated with the organized bodies in the cell, and (2) those which occur in the cell-sap or liquid of the cell.

The earliest color to appear in the developing plant is a yellow, and this is due to a principle which the author calls *etiophyl* to avoid confusion. This is associated

with a protoplasmic body termed by the author an *etioplast*. These bodies are more or less spherical or polygonal and are about one thousandth of a millimeter in diameter. They occur in the cells beneath the epidermal layer, and later, under the influence of light, appear to be transformed into chloroplasts, the bodies giving the color to the leaves and other green parts of the plant. Under certain conditions the chloroplastid may likewise undergo a transformation into a yellow orange-colored body, known as a chromoplast, the pigment associated with it being called by the author, chromophyl. These plastid pigments are distinguished from all other plant colors by their solubility in such solvents as benzol, ether, volatile oils, etc.

During the course of metabolism the plant cell manufactures other color substances which are not combined with the protoplasm or other organized bodies, but which are contained in the cell sap or liquid of the cell. These substances, unlike the plastid colors, are insoluble in the above-named solvents, but soluble in water and alcohol, which affords a means of separating them from the plastid colors. Most of the colors of flowers excepting yellow and orange are due to substances of this class. The colors of many fruits, as apple, cranberry, strawberry, blackberry, grape, etc.; of red and brown seaweeds; of vegetables, as turnip, radish, rhubarb, purple cabbage, etc., and also of autumn leaves belong to this class, that is, are cell-sap colors. The author's experiments tend to show that the color of autumn leaves, as beech, maple, oak, etc., are in the nature of cell-sap colors, rather than due to a compound associated with the plastids as has been supposed heretofore. His researches, furthermore, tend to show that there is considerable difference in the cell-sap colors, or dyes, from various plants, and while they are all more or less constant in their behavior toward sodium phosphate, yet their behavior with a dozen or more reagents shows that no two of them are precisely alike, or if they are alike are associated with substances which influence their behavior toward reagents. As illustrating this point it may be mentioned that while the color of red rose closely resembles that of the red portion of the turnip in many respects, it differs from it in that an alcoholic solution of red rose becomes cloudy or fluorescent on the addition of water and the color is intensified on the addition of salicylic acid. It is also interesting to note that in the kernel of black Mexican sweet corn contiguous cells may show different colors, as reddish, bluish-green and purplish, this being due to the nature of the other substances associated with the dye in the cell sap.

The author is inclined to look upon the chromoplastids of both flowers and fruits as having the special function of manufacturing and storing nitrogenous food materials, which are almost invariably contained in them, for the use of the germinating plant. He further considers the cell-sap colors, like other organized cell-contents, to be incidental to physiological activity and of secondary importance in the attraction of insects for the fertilization of the flower and dispersal of the seed.

SATURDAY, APRIL 9.

Morning Session—10 o'clock.

President Smith in the chair.

The Establishment of Game Refuges in the United States Forest Reserves: Mr. ALDEN SAMPSON, Haverford, Pa.

The author spent six months in the forest reserves of California and Washington, during the summer of 1903, as game preserve expert, sent out by the United States Biological Survey to study the problem of game refuges, and to select tracts

suitable for the purpose when the time for creating them shall come.

The general plan was outlined in what is known as the 'Perkins Bill,' which was passed by the United States senate in the spring of 1903, but did not come to a vote in the house. By its provisions the president would have power to designate certain tracts in the forest reserves where there may be no hunting; which shall serve as refuges and breeding grounds for wild animals. By this the extermination of the larger mammals will be prevented, and at the same time the hunting in the vicinity of these refuges will be maintained by the overflow of game, as is the case in the vicinity of the Yellowstone National Park. This is a type, on a large scale, of what it is desired to establish elsewhere.

These reserves will be mainly for the protection of deer which are to be found widely distributed. It is the intention to prevent the recurrence of that which happened in the case of the buffalo. Of the millions which once ranged over the plains, less than 1,000 now remain. It is hoped that their number will be increased. There remain two large herds of elk, one of about 16,000 in the Yellowstone Park, another of probably 3,000 in the Olympic Mountains in Washington; a band of 100 in California, besides which there are various small bands in different states. The antelope are nearly exterminated, as are the mountain sheep, but all of these, as well as the Rocky Mountain goat and various small animals and birds, will be preserved in the refuges when created. No fishing will be permitted within these tracts, so that the trout may breed unmolested. It is hoped that the control of the refuges will be placed under the Bureau of Forestry, with competent rangers to patrol them.

The paper read on this occasion set forth the various reasons which justify and demand the creation of game refuges in all parts of the country.

The Use of the Relative Pronouns in Standard English Writers: Professor Waterman T. Hewitt, Ithaca, N. Y.

The purpose of this paper is to present briefly the historical development and use of the relative pronouns in English since the time of Wycliffe. Mention is made of some of the best known English writers whose style is colored by certain special features in their use of subordinate sentences introduced by the relative pronouns. Then follows a discussion on the use of the relatives *that* and *which* with examination of their use in the Tyndale and King James's version of the Bible. Also in the Lord's Prayer as shown in translations from 1130 A. D. to the present time. Lastly the use of these pronouns in proverbs and children's rhymes is considered.

The Effect of the American Revolution Upon the English Colonial System: Mr. Sydney George Fisher, Philadelphia.

It is commonly supposed that England changed her methods of colonial government immediately after our revolution and learned to retain her colonies by the affectionate method without military force or coercion. This, however, is a great mistake. England became much more severe in her methods of colonial control after our revolution, and continued to carry out all the principles and policies against which we had rebelled.

England, after our revolution, governed Canada with the utmost severity, as Mr. Bourinot has described in his excellent books on Canadian history. Canada was allowed no local government, no county or township officers, and carefully prevented from imitating the New England town meetings, which were supposed by England to have been an important cause of

the American revolution. Our revolution caused England to tighten, not to loosen, her grip on her dependencies.

It was not until 1837 that the Canadian rebellion wrought a change in British colonial administration. Just at that time the whig party and free trade ideas were gaining a great ascendency in England, and as a result of these ideas and the Canadian outbreak in 1837 Great Britain gradually began to grant what is called 'responsible government' to the Canadian and Australian provinces. So that it is to the Canadian rebellion of 1837 rather than to our revolution that the present rather liberal and easy governments of Canada and Australia owe their existence. This change appears to have been an immense relief to the people of the Canadian and Australian provinces. The Canadians, after over seventy-five years of British rule, numbered, at the time of the rebellion of 1837, only 1,500,000, but in the succeeding sixty years of responsible government they have increased to 6,000,000. The Australian colonists have also gained a similar increase.

The Hedonic Postulate: Professor LINDLEY M. KEASBEY, Bryn Mawr, Pa.

Results of the American Ethnographical Survey: Professor MARION D. LEARNED, Philadelphia.

In the summer of 1902 the American Ethnographical Survey was organized to investigate the actual relations of the various race elements in our American population and their importance in American civilization. A sum of money was collected by the German American Alliance and the German American Historical Society, and a beginning made in Pennsylvania by an examination of the Conestoga region. The Conestoga expedition was composed of Professor M. D. Learned, director; Dr. G. D. Luetscher, Dr. Charles R. Miller, Dr. J. A. Bole, Mr. C. F. Brede, Mr. E. M. Fogel. Special attention was given to tracing the German settlements from 1709 on, and their relations to their English, Scotch-Irish and Welsh neighbors. A part of the expedition made a careful study of the community settlement of the Rappists, now located at Economy, Pa. A large amount of material was collected along the lines of early settlements and migrations, trades, industries and their effects upon the geographical distribution of the population, religion, education, politics, manners, customs, superstition, dress, language, literature and architecture. This material has been published in part in the following papers in the German American Annals:

1. 'The American Ethnographical Survey, Preliminary Report of the Conestoga Expedition,' by the director.

2. 'Benjamin Herr's Journal, 1830,' by the director.

3. 'An Old German Midwife's Record, 1791–1815,' by the director with C. F. Brede.

4. 'Industries of York and Lancaster Counties,' by G. D. Leutscher.

The following matter is in press and being prepared for the press:

1. 'History of the Rappist Settlement,' by J. A. Bole (in press).

2. 'The Official Report of the Survey.'

3. 'A Series of Race Maps, Showing the Distribution of the Race Elements at Different Periods.'

4. 'A Dialect Map, with Special Reference to the German Dialects.'

5. 'The Architectural Survivals.'

6. 'Studies in Literature, Language and Biography of the Region.'

Regulation of Color-Signals in Marine and Naval Service: Dr. CHARLES A. OLIVER, Philadelphia. Read by title.

The social features of the meeting were especially pleasant. In addition to the public reception on Thursday evening the

luncheons which were served in the hall of the society on Thursday and Friday afforded many opportunities for meeting old friends and making new ones. The culminating social event was the dinner given by the resident to the non-resident members at the Hotel Bellevue on Friday evening. On this occasion addresses were made by the president of the society, Professor Edgar F. Smith, of Philadelphia; Hon. George F. Baer, of Philadelphia; Professor Simon Newcomb, of Washington; Professor Edward S. Morse, of Salem; Professor George F. Barker, of Philadelphia; Professor William B. Scott, of Princeton; Professor Josiah H. Penniman, of Philadelphia; Mr. Henry LaBarre Jayne, treasurer of the society, and Dr. I. Minis Hays, one of the secretaries.

SCIENTIFIC BOOKS.

Vorlesungen über Experimentalphysik. Von August Kundt. Friedrich Vieweg und Sohn. 1903.

Few courses of lectures on general physics have been so well known as those of Professor Kundt at the University of Berlin. They were renowned throughout the world of students for their clearness of exposition, the enthusiasm both of lecturer and of listener, and the wonderful manner in which the facts of physics were illustrated by lecture-room experiments. Professor Kundt died in May, 1894, and steps were immediately taken to present to the world, in the form of a text-book of physics, his famous course of lectures. This has just been done, and the volume at hand from the press of Friedrich Vieweg is one of 851 pages illustrated with more than 500 figures in the text. There is an excellent portrait of Kundt, and a short but appreciative biography.

The lectures which are here reprinted are those given in the winter and summer semesters of 1888–9, which were noted by one of his students and afterwards were revised and worked over by Kundt himself. They are now published under the editorial supervision of Karl Scheel, who very wisely has made no attempt to add chapters, or even notes, with the idea of making the lectures describe the facts of physics which have come into prominence since the death of Kundt.

The course of lectures in general physics which has been given at the University of Berlin by a long line of distinguished men, including Helmholtz, Kundt and Kohlrausch, is one designed specially for students of medicine, or those who wish to become acquainted with the phenomena of physics, but who do not necessarily intend to follow more advanced work in physics, and who do not regard this course as of fundamental importance. This fact necessarily has a most important bearing on the character of the lectures given. In the majority of cases in American universities and colleges physics is now taught largely owing to its educational value, in the sense that in order for a student to follow the course intelligently he must exercise certain mental qualities which are of the utmost importance in any scheme of education. The character of text-book, therefore, which would best represent the needs of these two kinds of classes is quite different; and the main interest in this book of lectures of Kundt centers in his mode of presentation of the various branches of physics in order to meet the demands made by his conditions.

One can not do better in reviewing the book than to give a few details in regard to the number of lectures assigned to various subjects, and to note their order of arrangement. In all there are 150 lectures: 39 in mechanics and properties of matter, 17 in acoustics, 31 in heat (including five on the kinetic theory of gases), 43 in electricity and magnetism and 20 in light. This division is most interesting and, in some respects, surprising. In treating the subject of mechanics there are one or two introductory chapters followed by one in which are introduced the ideas of mass, force, work and energy; then the subjects of equilibrium and machines are introduced; gravitation and various pendulum problems are next discussed, and then the lectures return to the questions of centrifugal force and moments of inertia. There follow six lectures on liquids, seven on gases, three on solids and six on the bound-

ary phenomena between two different kinds of matter. It will be seen at once that the order of presentation adopted by Kundt is one which lends itself most easily to simplicity of treatment, and is not at all concerned with the logical development of the subjects. Throughout the whole book all mathematical points are avoided and the utmost required is a most elementary knowledge of geometry. There is no discussion whatever as to our mode of understanding what is meant by mass or force, and no attempt is made to show the logical connection between various subjects. As one reads the lectures one is struck with their clearness of thought, the beauty and vigor of expression, but above all with the fact that from the standpoint of interest to the class it would be impossible to present the subject in a better manner. All difficulties seem to vanish and the student is led from one phenomenon to another, and back again to more complex illustrations of the former, until all the essential facts of the subject are brought before him. If the treatment of the subjects of electricity and magnetism is analyzed, it is seen to be of the same general character as that of mechanics. There are a few chapters on the subject of electrostatic phenomena followed by a discussion of magnetism; then the ideas of electrostatic potential and capacity are introduced, and this leads to a discussion of electric currents. Special emphasis is laid throughout the whole book upon the description of instruments for measurement and for ordinary laboratory use, and the question of the development of ideas is in many cases subordinated to this. A marked illustration is afforded by the fact that, since an induction coil is ordinarily used in producing electric currents through gases, therefore the whole subject of induced currents is taken up before the chapter on conduction through gases. An illustration of the fact that the main object of these lectures is to describe physical phenomena and not explain them is shown by noting that there is no discussion whatever as to the energy of electrostatic or electromagnetic fields or of the reasons underlying electric and magnetic attraction and repulsion, and yet interference with convergent polarized light, quartz compensators, systems of multiplex telegraphy, etc., are discussed in full.

The publishers of this volume in their preliminary announcement express the belief that it will be useful to those who are following courses in physics as a text-book to accompany their lectures, and also to the scholar in general as an introduction to physical phenomena. They say, moreover, that every one who is familiar with the teaching of physics will receive, as he reads the book, continual pleasure from the elegant and original method of presentation of facts already known to him. These statements of the publishers fall short of the whole truth. There is no book at the present time, so far as known to the reviewer, which presents the subject of physics in such an attractive manner, and a translation of it in English would be of the greatest use in many colleges and schools. To the teacher of physics the great interest of the book lies in the fact that one has here an opportunity of seeing how a great master in the art of lecturing prepared his course; and, further, because he can not fail to learn many ways by which the subject may be made more interesting to his class and at the same time less difficult.

J. S. AMES.
THE JOHNS HOPKINS UNIVERSITY.

Disinfection and the Preservation of Food. By SAMUEL RIDEAL, D.Sc. New York, John Wiley and Sons. 8 vols., 504 pages, illustrated. $4.00.

THIS valuable work gives in convenient form the latest information respecting disinfection and the preservation of food. The greater part of the work is devoted to the subject of disinfection, and is so presented as to make it possible not only to carry this important process on on a large scale for public purposes, but also in a small way in private families. The various substances used for disinfection are described and their methods of application explained.

The different methods are grouped under the heads 'Mechanical Disinfection,' 'Sterilization by Heat' and 'Chemical Disinfectants.' Both sterilization by heat and the use of chemical disinfectants are also employed in the

preservation of food. Chemical disinfectants are described under the heads of 'Metallic Salts,' 'Organic Substances' and 'Compounds Related to the Alcohols.'

Methods of disinfection are described as related to towns and municipalities and as personal and internal disinfection. The chapter on the preservation of food is only a small part of the work and is not nearly so valuable as the part devoted to disinfection pure and simple. A résumé of legal statutes and regulations is also given and a short and necessarily brief account is given of the methods of analysis.

Of great interest is the discussion of those substances used both as disinfectants and as food preservatives. Many of these are described as non-poisonous, in such a way as to mislead the careless reader.

A careful reading of the article on fluorides would not warrant the apparent recommendation of it as a substance suitable for addition to food products.

Inasmuch as acetate of alumina has lately been used to a very large extent in sausages imported into this country, it is interesting to read, on page 175, the statement referring to this substance: 'It would doubtless be useful for surgical dressings but is unnecessary and unsafe as a disinfectant.'

In general it may be assumed that substances which are valuable for surgical dressings are not as a rule proper substances to be added to foods.

The salts of copper and zinc belong also to this class of bodies, and while their use as disinfectants is praiseworthy, their presence in food products is at least suspicious.

Other well-known substances belonging to both classes are salicylic and benzoic acids and their salts, sulphurous acid and its salts, and formaldehyde.

In regard to the preservation of food by these reagents the general tendency of Rideal's work is to discourage their use, and this tendency must, it seems to me, be commended by all thoughtful students of hygiene and nutrition. In spite of this general tendency, however, the department committee of the English government, while prohibiting absolutely the use of formaldehyde or preparations thereof in foods, recommends that salicylic acid may be used in quantities not greater than one grain per pound, except in milk, from which all preservatives of every kind are excluded. Cream and butter, however, are allowed to carry boric acid or borax; in the case of the former, in quantities not to exceed .25 per cent. of boric acid or its equivalent in borax; in the case of the latter, not to exceed .5 per cent. of boric acid or its equivalent in borax. In the case of foods intended for infants and invalids, however, all preservatives are to be excluded. At the International Congress of Hygiene at Brussels, 1903, resolutions were passed in favor of the total abolition of preservatives in all kinds of foods. This, however, as is seen, includes salt, sugar, wood smoke, etc., which have been in use from time immemorial and hence such a recommendation is too drastic (page 423).

The summary of facts respecting food preservation by chemicals is a very valuable part of this excellent work.

H. W. Wiley.

SCIENTIFIC JOURNALS AND ARTICLES.

The May number of *The American Journal of Science* contains the following articles: 'Recent Changes in the Elevation of Land and Sea in the Vicinity of New York City,' by G. W. Tuttle; 'Geology of Brome Mountain, one of the Monteregian Hills,' by J. A. Dresser, 'Crystallization of Molybdenite,' by A. J. Moses; 'Behavior of Typical Hydrous Chlorides when Heated in Hydrogen Chloride,' by F. A. Gooch and F. M. McClenahan; '*Stegomus Longipes*, a New Reptile from the Triassic Sandstones of the Connecticut Valley,' by B. K. Emerson and F. B. Loomis; 'Note on the Probable Footprints of *Stegomus Longipes*,' by R. S. Lull; 'Canyon City Meteorite from Trinity County, California,' by H. A. Ward; 'Two Microscopic-Petrographical Methods,' by F. E. Wright; 'Denucleating Effect of Rotation in Case of Air Stored over Water,' by C. Barus and A. E. Watson.

THE May number (volume 10, number 8) of the *Bulletin of the American Mathematical Society* contains the following articles: 'Report of the February Meeting of the American Mathematical Society,' by Professor F. N. Cole; 'Report on the Requirements for the Master's Degree,' by the Committee of the Chicago Section; 'On the Subgroups of Order a Power of p in the Linear Homogeneous and Fractional Groups in the $GF[p^n]$,' by Professor L. E. Dickson; 'The Exterior and Interior of a Plane Curve,' by Dr. G. A. Bliss; 'Ricatti Isothermal Systems—a Correction,' by Dr. Edward Kasner; Shorter Notices; Notes; New Publications.

ACCORDING to the annual announcement of the Marine Biological Laboratory at Wood's Hole, the *Journal of Morphology*, the publication of which was interrupted in 1901, at the conclusion of the seventeenth volume, is to be immediately resumed, and will be open for larger papers in animal morphology, requiring, as a rule, extensive illustration in lithographic plates. A *Journal of Animal Biology* is also to be undertaken in the interest of investigations upon living animals, dealing especially with the problems of evolution as presented in the phenomena of heredity, variation, hybridization, etc., and requiring experimental methods and methodical observation.

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

THE 152d meeting was held February 24, 1904.

Dr. Arthur L. Day presented a paper entitled 'The Study of Minerals in the Laboratory.' Dr. Day drew attention to the relation of some problems of physics to geology and pointed out the lines of investigation which had been undertaken by the Physical Laboratory of the United States Geological Survey. His paper was intended as an introduction to a summary of the results of certain investigations, an abstract of which will appear below.

This was followed by a discussion of the oil fields of Alaska, by Dr. George C. Martin. Indications of petroleum have been found at three distinct localities on the Pacific Coast of Alaska and have been reported from several others. The Controller Bay field lies adjacent to the coast, about twenty miles east of the Copper River delta. In this field one well has been drilled which struck oil and several others were being put down at the time of Dr. Martin's visit. The rocks, consisting of shales and sandstones, are closely folded and are probably of Tertiary age, and are overlain by coal-bearing horizons which are also Tertiary. The structure, as far as could be determined, is complex.

The second locality lies on the west shore of Cook Inlet, at Enochkin Bay. In this locality the seepages indicate the presence of petroleum, though the wells drilled thus far have not yielded any gushers. The oil-bearing rocks are of Jurassic age and are thrown up into broad, open flats.

One hundred miles to the southwest is Cold Bay, where a similar occurrence of petroleum seepages has been found. The geologic structure and rocks seem to be identical with those of Enochkin Bay. An account of these oil fields has been published by Dr. Martin in Bulletin 225, U. S. Geological Survey, pp. 362–385.

THE 153d meeting was held March 9 and the first paper was entitled 'Extra Morainic Pebbles in Western Pennsylvania,' by Mr. Lester H. Woolsey. Mr. Woolsey said that glacial pebbles, granites, diabases, etc., of probably Wisconsin or Iowan age, have been found in 950-foot terraces (supposedly Kansan) along Raccoon Creek in Beaver and Washington counties as far south as Burgettstown on the Panhandle Railway. Similar pebbles were found up to 1,100 feet elsewhere in Beaver County. This is some evidence of a general flooding of this region in post-Kansan time.

Mr. F. H. Knowlton then gave a paper on the 'Fossil Floras of the Yukon.' Up to about 1900 the known fossil flora of Alaska numbered about 110 species, all of which had come from the coast region from Sitka to Cape Lisburne. With the exception of the Cape Lisburne forms, which were regarded as of Jurasso-Cretaceous age, practically all those known were Tertiary in age. The discovery

of gold in the interior incited exploration, and soon small collections of plants were brought in, mainly from upper rocks of the Yukon. As these agreed in Tertiary age with those previously known from the coast region, it came to be accepted that only Tertiary plants occurred throughout this vast area. The U. S. Geological Survey desired to establish a type section, and in 1902 Mr. A. J. Collier was delegated to make a trip down the Yukon, studying the stratigraphy and collecting fossils from as many points as possible. When the plants were studied it was found that those from above Rampart were Tertiary (so-called Arctic Miocene), while below this point a very different condition was found. Near Nahoclatilten Mr. Collier obtained collections which appeared to be mixed, that is, a part of the material seemed to be Tertiary and the remainder Middle or Lower Cretaceous. Undoubted Upper Cretaceous plants were obtained from a number of other localities, especially in the vicinity of Nulato, but so much interest attached to the Nahoclatilten localities that in 1903 Dr. Arthur Hollick was commissioned to duplicate Mr. Collier's trip. From the combination of the two collections it is possible to decide with certainty that all points above Rampart are Tertiary, while below the plants indicate that the age is either undoubted Cretaceous or doubtful Tertiary. The Cretaceous plants include cycads of several genera, conifers and many dicotyledons, the combination resembling mostly the Middle and Upper Cretaceous flora of Bohemia.

Mr. Marius R. Campbell then discussed 'Glacial Erosion in Western New York,' devoting special attention to the origin of the Finger Lakes. Mr. Campbell's paper is soon to appear as a publication of the Geological Society of America.

The 154th meeting, held March 23, was devoted to a communication by Dr. Arthur L. Day, entitled 'The Study of Minerals in the Laboratory.' The following brief abstract contains the more important conclusions.

The paper is a summary of an extended experimental research by Dr. Day and Dr. E. T. Allen upon a series of artificial feldspars corresponding to albite (Ab) and anorthite (An) and the following plagioclases: Ab_1An_3, Ab_1An_2, Ab_1An_1, Ab_2An_1, Ab_3An_1 and Ab_4An_1. These were prepared with great care from the purest chemicals, and, with the exception of albite, which could not be crystallized on account of its extreme viscosity, were fully identified microscopically.

Melting-point determinations were obtained, beginning with anorthite and continuing down the series as far as Ab_3An_1. The viscosity was found to increase enormously toward the albite end of the series and appeared to veil the melting point completely below Ab_3An_1. In a specimen of natural albite (Mitchell County, N. C.) the viscosity of the glass during melting was found to be of the same order of magnitude as that of the crystallized portion, and crystals of microscopic size sustained a slow heating to a temperature of 150° above where melting began, and preserved their original orientation. It was also shown that in viscous liquids, capable of considerable undercooling, the solidifying point did not coincide with the melting point or bear any necessary relation to it.

The chemical purity of the artificial feldspars enabled very accurate determinations of the specific gravity to be made of both the vitreous and the crystalline form.

The following conclusions were offered as tending to show that the soda-lime feldspars form an isomorphous series and not a eutectic mixture:

1. In Ab_1An_3 the spherulites and the glass matrix were analyzed separately and proved to be identical in composition. In Ab_1An_2 a portion was crystallized rapidly and the matrix crystallized very slowly in a subsequent heating. The two sets of crystals, although very different in size, proved to be identical in composition.

If the relation had been that of a eutectic mixture, the component in excess must have crystallized out first.

2. The curve of melting points of the pure (artificial) feldspars of the series is a straight line for some two thirds of the distance from anorthite to albite (as far as it could be established). There is no reason to suspect a discontinuity in the lower portion of the curve.

3. The fact that natural albite (Mitchell Co., N. C., Amelia Co., Va.) is too low in melting point and too high in specific gravity to fall into line with the observations upon the pure feldspars is readily explained by the impurities established by the chemical analyses.

4. The curve of specific gravities of the artificial crystalline feldspars which admit of exceptionally accurate observation, on account of the chemical purity of the specimens, is also a straight line over practically the same range.

5. No natural feldspar is known with a lower specific gravity than albite.

The following preliminary figures were given:

	Melting Points.	Specific Gravity (Crystals).	Specific Gravity (Glass).
An	1532° C.	2.764	2.70
Ab_1An_5	1503°	2.736	2.65
Ab_1An_2	1464°	2.702	2.60
Ab_1An_1	1420°	2.670	2.55
Ab_2An_1	1374°		2.48
Ab_3An_1 ..about	1345°		2.46
Ab			2.38

ALFRED H. BROOKS,
Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 583d meeting was held March 26, 1904. The election of twelve new members was announced.

Mr. L. A. Bauer reported that magnetometer records showed slight earthquake shocks on March 16 and 21.

Mr. Bergen Davis, of Columbia College, spoke on 'The Theory of the Electrodeless Discharge.' A receiver containing gas is placed in the field of a coil through which an alternating current passes; when the field reaches a certain minimum potential there is a white discharge through the gas; this potential was determined as a function of the gas density and alternation-frequency. The results were found to be in close accordance with the theory of electrons.

Mr. P. G. Nutting then spoke on 'The Dynamics of a Moving Charge,' presenting systematically the dynamical principles that underlie the theory of electrons, and pointing out among other things the great differences in the nature of the fields produced by electrical charges moving at different velocities.

THE 584th meeting was held April 9, 1904, Vice-president Littlehales presiding.

Dr. Bauer reported that the earthquake shock of March 16 was recorded by the magnetograph at Baldwin, Kansas; such records have now been found made on about thirty different dates.

Dr. R. A. Harris, of the Coast and Geodetic Survey, presented a paper on 'Some Indications of Land in the Vicinity of the North Pole.'

The indications of land were based chiefly upon (1) the direction and velocity of the surface currents, known, in part, by the drifting of the *Advance* and *Rescue*, the *Jeannette* and the *Fram;* (2) the very old ice found northeast of Alaska; (3) the tides at Bennett Island, at Pitlekaj, along the northern coast of Alaska, and in the Arctic Archipelago. At Bennett Island the mean range of tide is 2 feet; at Pitlekaj, 0.2 foot; at Point Barrow, 0.4 foot, the flood there coming from the west.

The main conclusion arrived at was that a large trapezoidal tract of land may extend from near the North Pole towards Alaska and eastern Siberia—one corner lying nearly north of Bennett Island; another, a little west of north from Point Barrow; a third, a comparatively short distance northwest of Banks Land; and a fourth corner, north of Lincoln Sea.

The observations of Thomas Simpson show a remarkable change in the time of tide on the northern coast of Alaska near the eastern boundary. This seems to indicate that one or more islands probably lie not very far off to the northward of this locality.

The subject was further discussed by Dr. Dall.

Mr. George R. Stetson then read a paper on 'President Stiles and his Times, Yale, 1778–1795,' based on the recently published voluminous diaries. These were summarized, presenting a vivid picture of the political, intellectual, social and religious conditions of the times.

CHARLES K. WEAD,
Secretary.

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY GEOLOGICAL JOURNAL CLUB.

THE club during the last month has devoted much of its time to the reviewing of standard papers on ore deposits, for the benefit of students interested in economic geology. These articles were reviewed by L. T. Buell, C. H. Clapp, M. Rubel, G. G. Wald, A. H. Allen, W. G. Ball and B. L. Johnson. The other articles reviewed were:

B. L. Johnson, 'Native Gold Original in Some Metamorphic Gneisses' (*Eng. and Min. Jour.*, February 4, 1904); S. Shapira, 'Mining in Korea' (*Eng. and Min. Jour.*, March 3, 1904); W. L. Whittemore, 'Origin, Properties and Uses of Shale' (*The Michigan Miner*, November, 1899, to February, 1900); J. G. Barry, 'Controlling Sand Dunes in the United States and Europe' (*Jour. of Geog.*, March, 1904); E. Burton, 'The Glacial Geology of Tasmania' (*Quart. Jour. of the Geol. Soc.*, February, 1904); H. W. Shimer, 'Evolution of the Mosasaurs' (*Jour. Geol.*, February, 1904); C. E. Danforth, 'The American Mining Engineer' (*Eng. and Min. Jour.*, February 25, 1904).

Dr. D. W. Johnson spoke on 'A Problem in River-Capture.' His paper dealt with the present and former courses of the Tennessee River, and showed evidence for and against the present theory of its capture as proposed by Hayes and Campbell. Dr. Johnson is now in the field, making further investigation in this problem.

G. F. LOUGHLIN,
Secretary.

THE OHIO STATE ACADEMY OF SCIENCE.

THE thirteenth annual meeting was held at Denison University, Granville, November 27, with about thirty members in attendance.

In the course of the year the academy has published, in addition to its 'Annual Report,' three 'Special Papers': No. 5, 'Tabanidæ of Ohio, with a Catalogue and Bibliography of the Species from America North of Mexico,' 63 pages, by James S. Hine; No. 6, 'The Birds of Ohio, A Revised Catalogue,' with copious notes, 241 pages, by Lynds Jones; No. 7, 'Ecological Study of Big Spring Prairie,' 96 pages, by Thomas A. Bonser. The studies upon which these papers were based were largely carried on by aid from the Emerson McMillin Research Fund, and the expense of publication was mainly met by the further aid of the same fund. The series of special papers and the annual reports will be continued, but hereafter the *Ohio Naturalist* will be the official organ of the academy and in it will be published the abstracts and papers of less than 1,500 words.

The officers chosen for the ensuing year are:

President—E. L. Moseley.
Vice-Presidents—Lynds Jones and L. H. McFadden.
Secretary—F. L. Landacre.
Treasurer—Herbert Osborn.
Members of the Executive Committee—W. E. Wells and W. F. Mercer.
Member of Publication Committee—James S. Hine.
Trustee—W. R. Lazenby.
Librarian—W. C. Mills.

Correspondence regarding publications may be addressed to W. C. Mills, Page Hall, Ohio State University, Columbus, O.

The address of the president, C. J. Herrick, was on 'The Doctrine of Nerve Components and Some of its Applications.'

The following papers were read:

EDWARD L. RICE: 'Preliminary Report on the Development of the Gill in *Mytilus*.'

CHARLES S. MEAD: 'Comparative Chart of the Vertebrate Skull.'

F. L. LANDACRE: 'The Protozoa of Sandusky Bay.'

F. L. LANDACRE: 'A New Peritrichous Infusorian.'

MAX MORSE: 'Report on the Reptiles and Batrachians of Ohio.'

L. B. WALTON: 'Cataloguing Museum Collections.'

L. B. WALTON: 'A Practical Dissecting Tray.'

HERBERT OSBORN: 'A Further Contribution to the Hemipterous Fauna of Ohio.'

J. G. SANDERS: 'Report on the Scale Insects of Ohio.'

CHAS. S. MEAD: 'Report on the Orthoptera of Ohio.'

JAMES S. HINE: 'A Supplement to the Odonata of Ohio.'

A. F. BURGESS: 'Notes on the Introduction of the Chinese Ladybird, *Chilocorus similis*, in Ohio.'

HERBERT OSBORN: 'Notes on a Macropterous *Phylloscelis atra*.'

MAX MORSE: 'The Breeding Habits of the Myriopod, *Fontaria Indianæ* Boll.'

EDWARD L. RICE: 'A Statistical Plea for Nature Study.'

LEWIS G. WESTGATE: 'Shore Line Topography between Toledo and Huron, Ohio' (lantern slides).

J. H. TODD: 'Some Rare Forms of Aboriginal Implements.'

EDO. CLAASSEN: 'List of the Mosses of Cuyahoga County and of Several Other Counties of Northern Ohio.'

J. H. SCHAFFNER: 'Extra-Floral Nectaries and Other Glands.'

JOHN H. SCHAFFNER: 'Notes on Nutating Plants.'

OTTO E. JENNINGS: 'Notes on Some Rare and Interesting Ohio Plants.'

WM. R. LAZENBY: 'The Keeping Qualities of Apples.'

WM. R. LAZENBY: 'Seeds of Celastraceæ.'

L. B. WALTON: 'Variation and Environment.'

W. A. KELLERMAN: 'Further Floristic Studies in West Virginia.'

W. A. KELLERMAN: 'Additional Infection Experiments with Species of Rusts.'

W. A. KELLERMAN: 'Mycological Flora of Cedar Point, Sandusky, Ohio' (abstract).

W. A. KELLERMAN: 'Group Names in Natural History.'

W. A. KELLERMAN: 'Historical Account of Uredineous Culture Experiments, with List of Species' (abstract).

W. A. KELLERMAN and O. E. JENNINGS: 'Annual Report on the State Herbarium.'

E. L. MOSELEY,
Secretary.

DISCUSSION AND CORRESPONDENCE.

'HORSES' NOT HORSES.

THE notice by E. C. Case of 'The Tree Dwellers' exposes a truly remarkable view of nature and the relations of 'horses' of the present epoch to animals of the past. That picture of 'tiny little creatures' with 'five toes on each foot' flying from dinosaurs and escaping by climbing trees involves as grotesque confusion of time, place and adaptation of structure as could well be conceived. But the critic has not shown up one of the most misleading characteristics. The author, after asserting that 'long before the tree-dwellers lived there were wild horses' which were 'tiny little creatures,' naïvely adds, 'Perhaps you would not think that they were horses at all'! If 'you' did not think so 'you' would be perfectly right and any one who thinks otherwise perfectly wrong. The use of the word horse in such an enlarged sense has been to some extent encouraged by those who know better, but it is extremely deceptive. I have asked a dozen persons of more than average intelligence and culture (school teachers and college graduates) what idea they derived from the paragraphs in question, and found that those who had no special knowledge of zoology were entirely misled; they imagined an animal like an ordinary horse (more like a horse than a zebra or an ass is like a horse), differing simply in having five toes besides stripes like a zebra. Now, every instructed zoologist would know that such a characteristic as five (or four) toes must necessarily be coordinate with innumerable modifications of other parts and that, consequently, an animal so endowed must differ vastly more from a horse than an ass or a zebra does. In fact, every student of recent mammals would place the extinct beast in an entirely different family from the horse.

But no ungulate in the line of the horses with five toes has been discovered! The nearest approach to it is the *Hyracotherium* or *Eohippus* of the lower Eocene and that type had only four front toes and three hind ones; its jaws were relatively short, its teeth quite different from a horse's, and, in fine, its associated characters compel zoologists to differentiate it as the representative of a peculiar family—the Hyracotheriids. In an article (Horse) by a special student of the subject (Dr. William D. Matthews), just published in the Encyclopedia Americana, it is aptly stated that the 'first ancestor of the horse line is very difficult to distinguish from the contemporary ancestors of tapirs and rhinoceroses.'

Furthermore, I object to the assumption that the early representatives of the equine phylum were striped like a zebra. The only basis for such an assumption is that most of

the modern equids actually have such stripes, but the diversity between them leads one to suspect the universality of the tendency and to believe that it is of recent origin. At any rate, no one has a right to take it for granted that primitive forms were striped. The evidence, such as it is, is against the assumption.

Another pure assumption is that the primitive equoidean animals lived especially in the marshes. (The unfortunate author of 'The Tree Dwellers' of course misread 'nature' in postulating that 'the land at that time'—when five-toed horses lived!—'was almost entirely covered with water.') The assumption is based on the obvious fact that a four- or five-toed spreading foot is better adapted for progression on soft earth than a soliped, but there is no reason for confining such animals to marshes. The elephants and rhinoceroses are not marsh-loving animals.

The misuse of the word horse is in natural sequence to the same idea that has been carried to an extreme in 'The Tree Dwellers'; it is the expression of a contemptuous condescension or concession to such as are assumed to be insufficiently educated or receptive to be addressed in more precise language. In the extreme form—disconnected sentences and crude verbiage—analogous language is known as 'baby talk.' Science is scarcely food for babies.

THEO. GILL.

SPECIAL ARTICLES.

THE INFLUENCE OF CLIMATE AND SOIL ON THE TRANSMITTING POWER OF SEEDS.*

In speaking of the influence of soil and climate on the transmitting power of seeds, I will confine myself to certain practices which seedsmen have been taught to follow through long experience, as indicative of certain botanical facts, rather as if these facts had been established by scientific study and experiment.

Speaking first of leguminous plants, in the 'Extra Early' varieties of garden peas the desirable form of vine is one eighteen to forty inches high, and of a determinate growth, by which term I mean a vine that before the lowest and first formed pod has become too large for use as green peas, has completed its elongation and has its apex crowned by a well-formed pod or at least one well out of the blossom. The objectionable form is a vine twenty-four to sixty inches in height, which even when the lowest pod is fully ripe is still growing having its apex covered with blossoms and buds. Such plants as these last are called by seedmen 'wicks' or 'offs,' and a stock of 'Extra Early' peas is valued in inverse proportion to the number of such plants it produces. I never have seen a stock which did not occasionally produce them, and in number varying with different conditions of cultivation. On very rich soils, or those which have been recently fertilized with stable manure, there will be a great many more such plants developed than on a poorer soil. A stock which, when grown on a white clay soil of uniform composition, will ripen down very uniformly and not show more than a dozen such 'offs' to the acre, will, when planted on a mucky soil or one which has been enriched by fresh stable manure, give a dozen 'offs' to the square rod.

As an illustration in detail is a case when three large fields of very favorable soil were planted with the same stock, two of them when visited showed practically no 'offs,' nor were there many to be seen in the third field, except in a double row of circles, each about ten feet in diameter, where piles of manure had been spread, and in each of them there were twelve to twenty-five bad 'offs' more than could be found on an acre of the rest of the field.

Seedsmen find that if the seed from such 'off' plants grown from good stock is planted on soils favorable for the development of the true type, it will produce few, very few, often no more 'off' plants than seed from plants of the true type grown from the same stock; but if seed from the 'off' plants is sown on soil favorable for the development of 'off' plants, they will produce more 'offs' than seeds from the true type, and this tendency to produce 'off' plants on either favorable or unfavorable soil increases very rapidly with the number of consecutive generations of 'off' plants back of the seed in question. An illustration was given of precisely similar results

* Read before Botanical Club of Washington.

with 'American Wonder' peas when the character of soil favorable for the most desirable type is the opposite of that favorable for the best 'Extra Earlies.'

Seedsmen commonly believe that, in the case of peas, the character of the soil has a marked influence over the character of the plant, and that this influence extends to and is carried by the seed, but that such soil influence is decidedly cumulative in its effects, so that in practice they attach little importance to it for *one season,* but carefully avoid the use of stock seed which has been submitted to such influence for consecutive years.

Again in the case of garden beans, the tendency of rich, moist, heavy soil is to produce thick, fleshy pods slow to mature, while that of warm sandy land is to the production of flatter, less fleshy and quicker maturing pods. I can best illustrate this by experience. Some ten years ago I sent each of two growers living within a mile of each other, seed of 'Valentine' bean of precisely the same stock grown the previous year in the same field, which was a rich clay loam. One of these, whom I will call *C,* planted on rather heavy, rich soil, the other, *S,* on a light warm but rich sandy one. The next season *C* received seed grown by *S* and *S* seed grown by *C,* while a third man, *M,* some five miles away, on rich loam soil, received equal parts of both. When I visited the fields I noticed that in *C*'s field, which I supposed was planted wholly with seed grown by *S,* there were ten rows which differed from the rest and were such as I would expect if seed from *C* was planted, and I tried to account for them by extra manure, etc.; but I learned that as there was not quite enough of the seed from *S* sent him, he had filled out with some of his own, and I had detected the exact row where the seed was used. I then visited *M* on loam soil, and while I could tell that one part of the field was planted with *C* stock and the other with *S,* I could not detect the line between them.

These experiences seem to indicate that in leguminous plants soil does have an influence which is carried in the seed, and is cumulative in character, but in all my experience I have never seen any influence of the climate over the seed of leguminous plants.

The only gramineous plant with which I have had a large experience is sweet corn, and here the case of legumes is reversed. I have never been able to detect any influence of soil over the character of the seed produced, but I believe that climatic condition does have a marked influence, and that the difference between stock grown east and that grown west is the result of climatic rather than soil condition. People who use large quantities of sweet corn are very positive in their belief that seed produced in the eastern states gives a better product than that grown at the west. Some seedsmen agree with them, others maintain that if *eastern stock* seed is used just as good corn can be grown in the west. It seems to me that that *if* not only undermines their contention, but shows that seedsmen have a practical belief in the cumulative influence of soil and climate.

Turning now to cucurbits, in my experience I could never detect any effect of either soil or climate on seed of cucurbitaceous plants of the *same stock.* I don't wish to be understood as saying that soil and climate have no influence over the fruit, for they do quite as much as with any plant, but that this difference is not carried in the seed. As an illustration the writer has knowledge of a case where seed from small but select fruits grown in Michigan was sown in Oklahoma by the side of seed from large plants of the same pedigree grown in Oklahoma, and the result was equally large fruit in both cases. Also, in another case an old and experienced grower in Michigan, who claimed that he should be paid more for seed grown in Michigan, because earlier and better, was given seed of the same stock, grown for three generations in Michigan and for four generations within 200 miles of Gulf of Mexico, to plant side by side, and told that if he could detect any difference in the crop, his request would be considered, but he was unable to do so.

I have had the same sort of results with cucumber, muskmelon and squash, and it has made me think that seed of cucurbits do not carry influences of soil and climate, even when

such influence has accumulated for several generations. If time would permit I might go on and speak of tomatoes, cabbage and onion, each of which in my experience seems to have distinct habits in this respect, and considering all these cases it seems to me that plants of different natural orders differ in the degree to which influences of soil and climate are transmitted through the seed.

WILL W. TRACY, SR.

CURRENT NOTES ON METEOROLOGY.

CHANGES OF CLIMATE IN CENTRAL AFRICA.

IT is reported (*Pet. Mitth.*, X., 1903) that Lake Shirwa, southeast of Lake Nyassa, in central Africa, has entirely disappeared. Desiccation has been going on for many years, but the last stages in the process were very rapid. This lake used to be shown on the maps as an oval-shaped body of water, about thirty miles long and ten to fifteen miles wide. It now consists of a few small ponds. Livingstone discovered the lake in 1859. Lake Ngami, also discovered by Livingstone, has since disappeared. These changes seem to be a manifestation of a gradual desiccation which is going on in central Africa, but it is important that they should be more carefully studied before any definite conclusions are drawn. The recent reports to the effect that the Sea of Azov is drying up are misleading, in that the apparent desiccation seems actually to be due to a silting up of the lake.

A NEW DROSOMETER.

THE measurement of dew has always given trouble, because no drosometer has ever commended itself for universal use, and the results obtained by different methods have not been accurate, satisfactory or comparable. In *Das Wetter* for March, Ferle, of the Agricultural Experiment Station of Peterhof-Kurland, describes a new kind of drosometer, which he has found very useful, viz., a piece of specially prepared paper, soaked in a chemical solution. This paper is exposed over a box placed on the ground at night, and the amount of dew is indicated by the discoloration of the paper. A scale of discoloration, determined by experiment, is adopted, and the entry in the observation record book, based on the amount of discoloration, gives the amount of dew which formed during the night. Three kinds of paper are used, the first for the smallest amounts, the second for larger, and the third for the largest amounts. It is best to expose two kinds of paper, selected according to the season, so that, in case the amount of dew is too great to be indicated by one sheet, it may be recorded by the discoloration of the other paper.

METEOROLOGICAL OBSERVATORY ON MONTE ROSA.

AT the instance of the Italian Alpine Club, and with the support of Queen Margarita, the Duke of the Abruzzi, and of the Italian Ministry of Agriculture, an observatory has been erected on Monte Rosa, at an altitude of 4,560 meters (14,960 ft.) above sea level. Next to the Vallot Observatory on Mont Blanc, this is the highest meteorological station in Europe. Observations are to be begun during the coming summer. The observer is to live at the summit throughout the summer months, and during the winter when weather conditions are favorable. The observatory is to be open to scientific men of all nationalities who wish to carry on investigations there. The observations made on Monte Rosa will be of special value in connection with the international balloon ascents. The Monte Rosa Observatory will have, as companion Italian institutions, the Etna and the Monte Cimone observatories, at 2,942 (9,650 ft.) and 2,162 (7,095 ft.) meters respectively.

METEOROLOGICAL INSTITUTE OF ROUMANIA.

AMID the disturbed political conditions on the Balkan Peninsula, the Meteorological Institute of Roumania, under the able directorship of Dr. Hepites, continues its excellent work. Vol. XVI. of the *Annals* of the institute is at hand, comprising over 700 quarto pages, containing the annual report of the director for the year 1900; memoirs on the rainfall, earthquakes, climatology and magnetic observations of 1900; the regular hourly observations of all the elements at Bucharest, as well as the means for the 16 years 1885–

1900, for the successive lustra between 1885 and 1900, and the observations made at 52 stations of the second order during 1900. There are now 395 rainfall stations in Roumania. An index of the publications of the Roumanian Meteorological Institute from 1885 to 1903, comprising 31 octavo pages, offers the best of evidence as to the scientific activities of this institution.

R. DEC. WARD.

ERWIN E. EWELL.

ERWIN E. EWELL, lately first assistant chemist of the U. S. Department of Agriculture and more recently representative of the German Kali Syndicate in the Southern States with headquarters at Atlanta, Georgia, died in New Orleans, La., on February 7, after a brief but severe attack of grippe and rheumatism, followed by typhoid fever.

Mr. Ewell was born in Washington, Michigan, in 1867. His education was secured entirely through his own exertions since, through the death of his father, he was at an early age thrown entirely upon his own resources. He was graduated from the University of Michigan in 1890 and in the same year entered into the service of the Bureau of Chemistry of the Department of Agriculture. His efficiency led to his advancement to the position of principal assistant chemist of the department, and he contributed very largely to the success of the bureau. He was greatly interested in standards of measurements, was chairman of the committee of the American Chemical Society to secure better uniformity and accuracy in the standards in use and he was active in promoting the movement which finally led to the establishment of the bureau of standards. In 1903 he entered the service of the German Kali Syndicate and had begun with his characteristic energy and enthusiasm the presentation of the importance of potash salts in the nutrition of farm crops.

The many warm friends of Mr. Ewell will find in his death a serious personal loss and the scientific world will miss one of its most effective workers.

SCIENTIFIC NOTES AND NEWS.

THE summer meeting of the American Chemical Society will be held at Providence, R. I., June 21–23.

THE Alumni Association of the School of Applied Science of Columbia University has arranged to have painted a portrait of Dr. Charles F. Chandler, head of the Department of Chemistry. The portrait will be presented at the sesquicentennial celebration in October, when Dr. Chandler will have been for forty years professor of chemistry at the university.

THE alumni of the engineering department of the University of Michigan, now resident in Chicago and vicinity, have presented to the university a portrait in oil of the late Professor Charles E. Greene, dean of the engineering department from its organization until his death.

PROFESSOR W. OSTWALD gave the Faraday lecture of the Chemical Society at the Royal Institution, London, on April 19. At the close of the lecture he was presented with a medal bearing the image of Faraday, which had been specially struck for the occasion.

PROFESSOR L. V. KELLOGG, of the Department of Entomology of Stanford University, has been elected a member of Société Entomologique de France.

M. GUICHARD has been elected a member of the Paris Academy of Sciences in the section of geometry.

THE University of Glasgow has conferred its Doctorate of Laws on Professor Mendelejev, the eminent chemist.

AMONG the distinguished lecturers at the summer session of the University of California, which begins on June 27, are Professor Svante A. Arrhenius, of the University of Stockholm; Professor Hugo De Vries, of the University of Amsterdam; Sir William Ramsay, of University College, London, and Professor James Ward, of the University of Cambridge.

PROFESSOR RUSSELL H. CHITTENDEN, director of the Sheffield Scientific School, Yale University, on April 29, tendered a banquet in honor of Dr. C. S. Sherrington, professor of physiology in the University of Liverpool, who

is delivering the Silliman lectures at Yale. There were twenty guests, including President Hadley, Yale; Professors Bowditch and Porter, Harvard; Dr. Graham Lusk, New York; Dr. Frederic S. Lee, Columbia; Professor Reichert, Pennsylvania; Dr. Francis Bacon, New Haven; Professor Dunham, New York; Dr. W. H. Carmalt, New Haven; Professor L. B. Mendel, Yale; Dr. Otto G. Ramsay, Yale; Professor Abbott, Pennsylvania; Dr. J. P. C. Foster, New Haven; Professor Yandell Henderson, Yale; Dean Herbert E. Smith, of the Yale Medical School; Mr. Horace Fletcher, Venice, and Dr. Sherrington.

Captain Bernier, who is going out in charge of the Canadian Arctic expedition, was among the passengers by the steamship *Kaiser Wilhelm II.* which arrived at Plymouth on April 18. He was accompanied by 24 of his crew, and went on in the ship to Bremen, whence they will navigate the German ship *Gauss,* which has been purchased by the Canadian government.

Dr. John M. Macfarlane, professor of botany at the University of Pennsylvania, has been granted a four months' leave of absence to make botanical investigations in England, Italy and Switzerland.

Assistant Professor Herbert N. McCoy, of the Department of Chemistry of the University of Chicago, has gone abroad to visit German laboratories.

Professor G. J. Peirce, of Stanford University, intends to spend June and July with Professor Pfeffer in the laboratory of plant physiology at Leipzig. He will attend the meeting of the British Association for the Advancement of Science at Cambridge and will spend October and November at the Marine Biological Station at Naples, where he will occupy one of the tables maintained by the Carnegie Institution.

Professor Gilbert D. Harris, of the department of geology of Cornell University, spent the winter months in Louisiana as geologist of the state survey, exploring and mapping the oil regions.

Professor W. J. Kennedy, chief of the department of animal husbandry at the Iowa State College of Agriculture, has been commissioned by the Department of Agriculture to spend a year in Europe studying the live stock industry in various countries.

M. Hamy, professor of anthropology at the Paris Museum of Natural History, has been given leave of absence for the year 1904. His courses will be given by M. Verneau.

Mr. A. G. Ruthven, of the Zoological Department of the University of Michigan, is making a special study of the North American species of garter snakes (*Eutænia*), and wishes to receive specimens in large numbers from all parts of North America. Collections of these snakes will be determined for duplicates. Directions for the collection, preservation and shipment may be secured upon application to the above address.

Mr. L. B. Elliott, who completed his studies at the University of Iowa in 1892 under the personal direction of Professors Calvin and MacBride, and who has since that time been connected with the Bausch & Lomb Optical Company, Rochester, N. Y., and editor of the *Journal of Applied Microscopy and Laboratory Methods* since its beginning in 1898 until its recent discontinuance, has severed his connection with that company to accept a position with the T. B. Dunn Company, of Rochester, N. Y. Mr. Elliott will continue his private work in laboratory photography and biology as heretofore. His address is 17 Birr Street, Rochester, N. Y.

Mr. Charles F. Townsend, director of the New York Aquarium, gave the tenth lecture in the course before the College of the City of New York on April 29, his subject being 'The Depths of the Sea.'

At the annual graduation ceremonial of the University of Glasgow, on April 18, a medallion bearing a bas-relief of John Young, professor of natural history and keeper of the Hunterian Museum from 1856 to 1892, was presented to the university.

President Schurman, of Cornell University, will give an address in memory of Herbert Spencer, on Sunday, May 7.

The Institute of France has appropriated 10,000 francs from the income of the fund left

by M. Debrousse for the publication of the works of Leibnitz.

SIR CLEMENT NEVE FOSTER, F.R.S., professor of mining in the Royal College of Mining, London, died on April 19, aged fifty-three years.

F. J. WELLS, assistant professor of agricultural physics in the college of agriculture of the University of Wisconsin, died on March 1.

GEORGE A. MARTIN, editor of the *New England Farmer* and a well-known writer on agricultural topics, died at his home in Brattleboro, Vt., on April 16, aged seventy-three.

DR. CHARLES SORET, formerly professor of experimental physics at Geneva, died on April 5, at the age of fifty years.

DR. ANDREW PEEBLES AITKEN, professor of chemistry and toxicology, in the Royal Veterinary College, Edinburgh, died on April 17. He received the M.A. degree from Edinburgh in 1867.

THE American Geographical Society has received a bequest of $30,000 from Sarah M. de Vaugrigneuse.

THE Department of Conchology of the American Museum of Natural History has received as a gift from Mr. Albert H. Storer, of New York, the valuable collection of shells which was made by his father.

M. J. J. SIEGFRIED has given to the Institute of France the Castle of Langeais, with the sum of 100,000 francs for the costs of installation and an endowment yielding an income of 10,000 francs for its support.

THE Association of American Agricultural Colleges and Experiment Stations will meet during the week beginning October 30, probably at Des Moines, Ia.

ENGINEER BROUSNEFF, who was sent out in the spring of 1903 by the Imperial Academy of Sciences, at St. Petersburg, in company with Lieutenant Kolchak and a number of experienced Yakuts, towards New Siberia and Bennett Island, to search for the Polar expedition headed by Baron E. Toll, has returned without results. The academy has issued the following notice: Baron Edward Toll, chief of the polar expedition sent out by the Academy of Sciences, left the Bennett Island, lying north of New Siberia, on October 26 (November 8), 1902, taking a southern direction. He was accompanied by the astronomer Seeberg and two Yakuts. The party seems to have been carried away by the ice. As the researches hitherto made have been in vain, a reward of 5,000 roubles (about $2,500) is offered by the Academy of Sciences for finding the whole expedition party, or any part of it, and a reward of 2,500 roubles for giving the first exact indications of tracing the party.

THE director-in-chief and other members of the staff of the New York Botanical Garden will be pleased to receive members and their friends at the grounds in Bronx Park on every Saturday in May and June. The train leaves Grand Central Station at 2:35 P.M., for Bronx Park, returning at 5:32 P.M. Opportunity will be given for inspection of the museums, laboratories, library and herbarium, the public conservatories, the herbaceous collection, the hemlock forest, and parts of the arboretum. The walk planned will be a little over a mile. Lectures will be delivered in the lecture hall of the museum building at 4:30 o'clock, as follows:

April 30.—'Japan, the Land of Lacquer and Bamboo,' by Dr. C. F. Millspaugh.

May 7.—'The Form, Habits and Relationships of the Cactuses,' by Dr. N. L. Britton.

May 14.—'The Vegetation of the Delta of the Colorado River, and of Baja California,' by Dr. D. T. MacDougal.

May 21.—'Explorations on the Yukon River, Alaska,' by Dr. Arthur Hollick.

May 28.—'Arctic and Alpine Plants,' by Professor F. E. Lloyd.

June 4.—'Carnivorous Plants,' by Professor H. M. Richards.

THE U. S. Geological Survey completed the twenty-fifth year of its existence on March 3, 1904. The quarter-century anniversary happened to fall near the date set for the opening of the Louisiana Purchase Exposition at St. Louis, at which the survey will make an exhibit. It is hoped that this exhibit will increase the popular interest in the survey, and in this connection it has been thought

desirable to place before the public, by means of a small bulletin, an account of its organization and work and the results it has achieved. Copies of this bulletin will be distributed at St. Louis and other copies may be obtained by application to the director of the U. S. Geological Survey, Washington, D. C. The bulletin, which is No. 227 of the survey series, is entitled, 'The United States Geological Survey: Its Origin, Development, Organization and Operations.'

UNIVERSITY AND EDUCATIONAL NEWS.

THE Ohio legislature has appropriated for the next biennial period for the Ohio State University the following amounts:

Current expenses	$635,000
New chemical building	100,000
Ceramic and mining building	85,000
College of Agriculture	75,000
Equipment of chemistry and physics buildings	25,000
Emergency fund	15,000
Total	$935,000

This is about 50 per cent. increase over the largest preceding appropriation. The university has other sources of income which will yield approximately $200,000 for the biennial period.

THE will of the late A. C. Hutchinson, according to which the Medical College of Tulane University receives nearly $1,000,000, has been sustained by the Supreme Court of the state of Louisiana.

NEW YORK UNIVERSITY has received an anonymous gift of $12,500 for the Medical College.

THE reorganized Board of Regents having charge of the educational affairs of the State of New York held its first meeting at Albany on April 28 when Dr. Whitelaw Reid was elected chancellor. The following appointments were announced: *First Assistant Commissioner,* Howard J. Rogers, Albany; *Second Assistant Commissioner,* Edward J. Goodwin, New York City; *Third Assistant Commissioner,* Augustus S. Downing, New York City; *Director of Libraries,* Melvil Dewey, Albany.

A 'JOINT Announcement of Field Courses in Geology,' for the summer of 1904, has lately been issued by several universities, with the object of placing concisely before American students the opportunities for practical study of this science in different parts of the country. Fifteen universities were invited to take part in the announcement: four responded with statement of courses for the current year; others stated that they would probably cooperate in the plan of joint announcement if it were repeated in 1905. Chicago and Harvard each offer four courses; five courses in the Rocky Mountain region, two in the upper Mississippi Valley, and one in New York State. Johns Hopkins gives opportunity for professional work in connection with the Geological Survey of Michigan. Columbia has a brief spring course, limited to her own students. Scholarships are available in connection with some of the courses. The circular can be had on application to the geological department of any of the universities concerned.

DR. BARTON WARREN EVERMANN, assistant in charge of scientific inquiry in the U. S. Bureau of Fisheries, has been asked to give a course of lectures on fish culture and game protection to the seniors of the College of Forestry of Yale University. The course will consist of lectures and field work and will be given during the fortnight beginning May 9, at Milford, Pa., where the class will be engaged in field studies.

THERE will be a vacant instructorship in physics at Purdue University next June. The salary for the first year will be eight hundred dollars.

DR. JOHN DEWEY, of the University of Chicago, has been elected professor of philosophy at Columbia University.

DR. CHARLES R. BARDEEN, associate professor of anatomy at the Johns Hopkins University, has accepted the chair of anatomy at the University of Wisconsin.

ASSISTANT PROFESSOR VICTOR LENHER, Charles Elwood Mendenhall and William Swan Miller, of the University of Wisconsin, were made associate professors by the action of the regents of the university at their April meeting.